

# Multimodal Transportation Analysis (MMTA) for Site Development - EXAMPLE

July 2023

*This document should be used as a guide when completing an MMTA and is not indicative of a complete study. This example is an abbreviated version.*



# Contents

- 1 Introduction and Project Description ..... 3
- 2 Traffic Review..... 5
  - 2.1 Existing Roadway Network..... 6
  - 2.2 Existing Traffic Volumes..... 7
  - 2.3 Existing Traffic Level of Service..... 8
  - 2.4 Future No-Build Traffic Volumes..... 9
  - 2.5 Future No-Build Traffic Level of Service..... 10
  - 2.6 Trip Generation..... 10
  - 2.7 Mode Split ..... 11
  - 2.8 Future Roadway Network..... 12
  - 2.9 Future Traffic Volumes..... 13
  - 2.10 Future Traffic Level of Service..... 15
  - 2.11 Traffic Level of Service Summary ..... 16
- 3 Multimodal Review..... 18
  - 3.1 Bicycle Network Compliance with NDOT Standards..... 18
  - 3.2 Pedestrian Network Compliance with NDOT Standards..... 18
  - 3.3 Level of Traffic Stress Analysis..... 21
  - 3.4 Transit Stop Evaluation..... 25
  - 3.5 Transit Stop Access Evaluation ..... 26
- 4 Safety Review ..... 29
  - 4.1 High Injury Network..... 29
  - 4.2 Site Access Evaluation ..... 29
  - 4.3 Historical Crash Evaluation ..... 31
- 5 Conclusion ..... 38
  - 5.1 Community Needs ..... 38
  - 5.2 Mitigation Measures ..... 40



# 1 Introduction and Project Description

The purpose of this report is to analyze the transportation network adjacent to the proposed Midtown Mixed-Use development and to evaluate the associated impacts to traffic operations, multimodal mobility, and safety. The proposed development, expected to be completed in 2026, will consist of approximately 450 multifamily units and 30,000 square feet of commercial space.

The property is located along the south side of McGavock Street between 17<sup>th</sup> Avenue South and 16<sup>th</sup> Avenue. The property has frontage along 17<sup>th</sup> Avenue South and McGavock Street.

The study area consists of the following intersections:

1. Division Street and 17<sup>th</sup> Avenue South / Music Square West
2. 17<sup>th</sup> Avenue South and McGavock Street
3. 16<sup>th</sup> Avenue South and McGavock Street
4. 17<sup>th</sup> Avenue South and Broadway
5. Broadway / West End Avenue and 16<sup>th</sup> Avenue South

The study area consists of the following segments:

1. 17<sup>th</sup> Avenue South between Division Street and McGavock Street
2. McGavock Street between 17<sup>th</sup> Avenue South and 16<sup>th</sup> Avenue South
3. 17<sup>th</sup> Avenue South between McGavock Street and Broadway
4. Broadway between 17<sup>th</sup> Avenue South and 16<sup>th</sup> Avenue South
5. 16<sup>th</sup> Avenue South between Broadway and McGavock Street

Figure 1.1 provides an aerial image of the development location and study area.



Figure 1.1 Study Area Aerial



## 2 Traffic Review

The expected traffic impacts of the new development are analyzed in this section. The three scenarios evaluated as part of the Traffic Review are (1) Existing 2023 Conditions, (2) Future 2026 No-Build Conditions, and (3) Future 2026 Build Conditions.

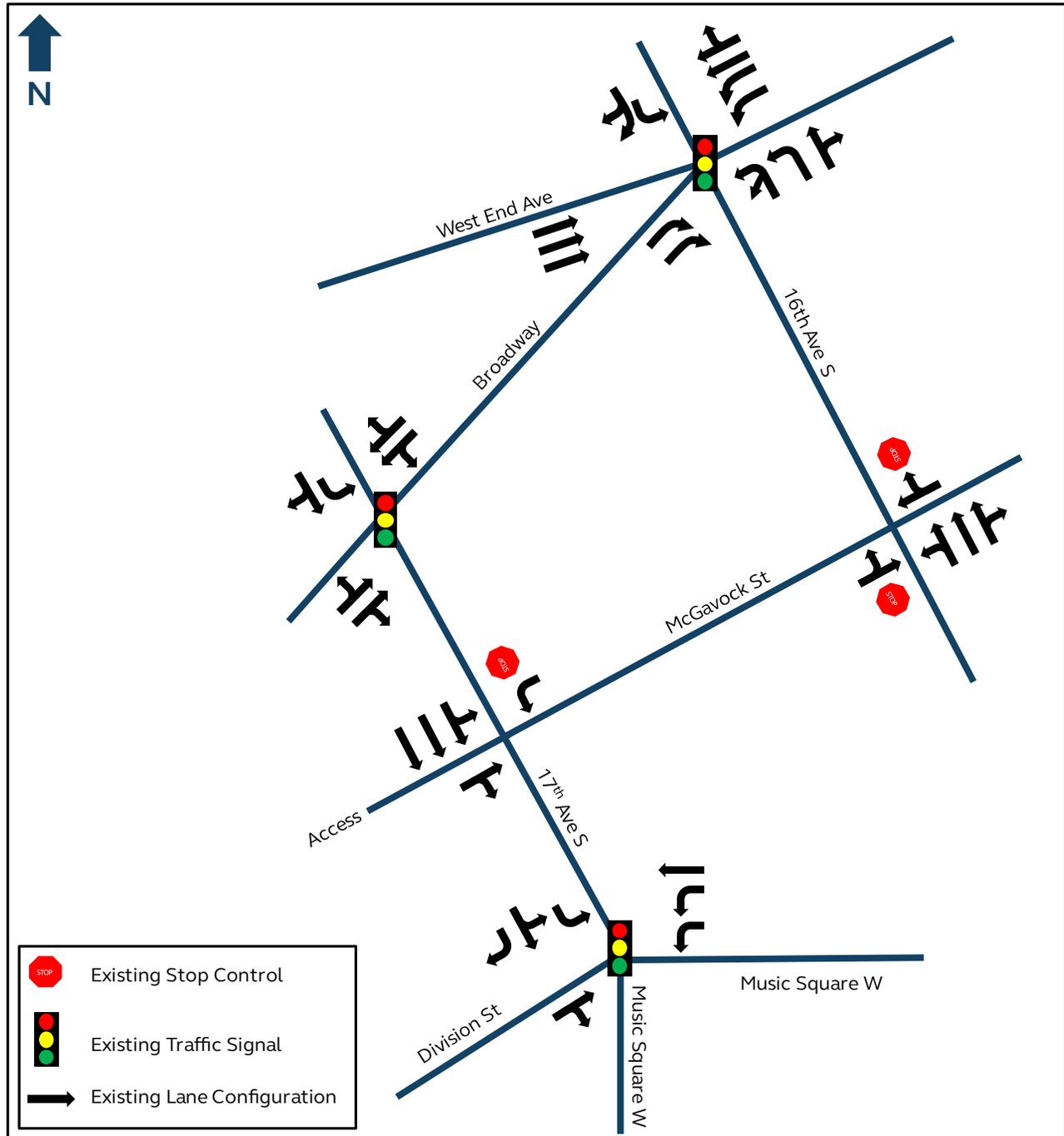
For the purposes of this report, 16<sup>th</sup> Avenue South and 17<sup>th</sup> Avenue South are considered to have a north-south orientation. Broadway, West End Avenue, McGavock Street, Division Street, and Music Square West are considered to have an east-west orientation.



## 2.1 Existing Roadway Network

The existing roadway network is illustrated in Figure 2.1.

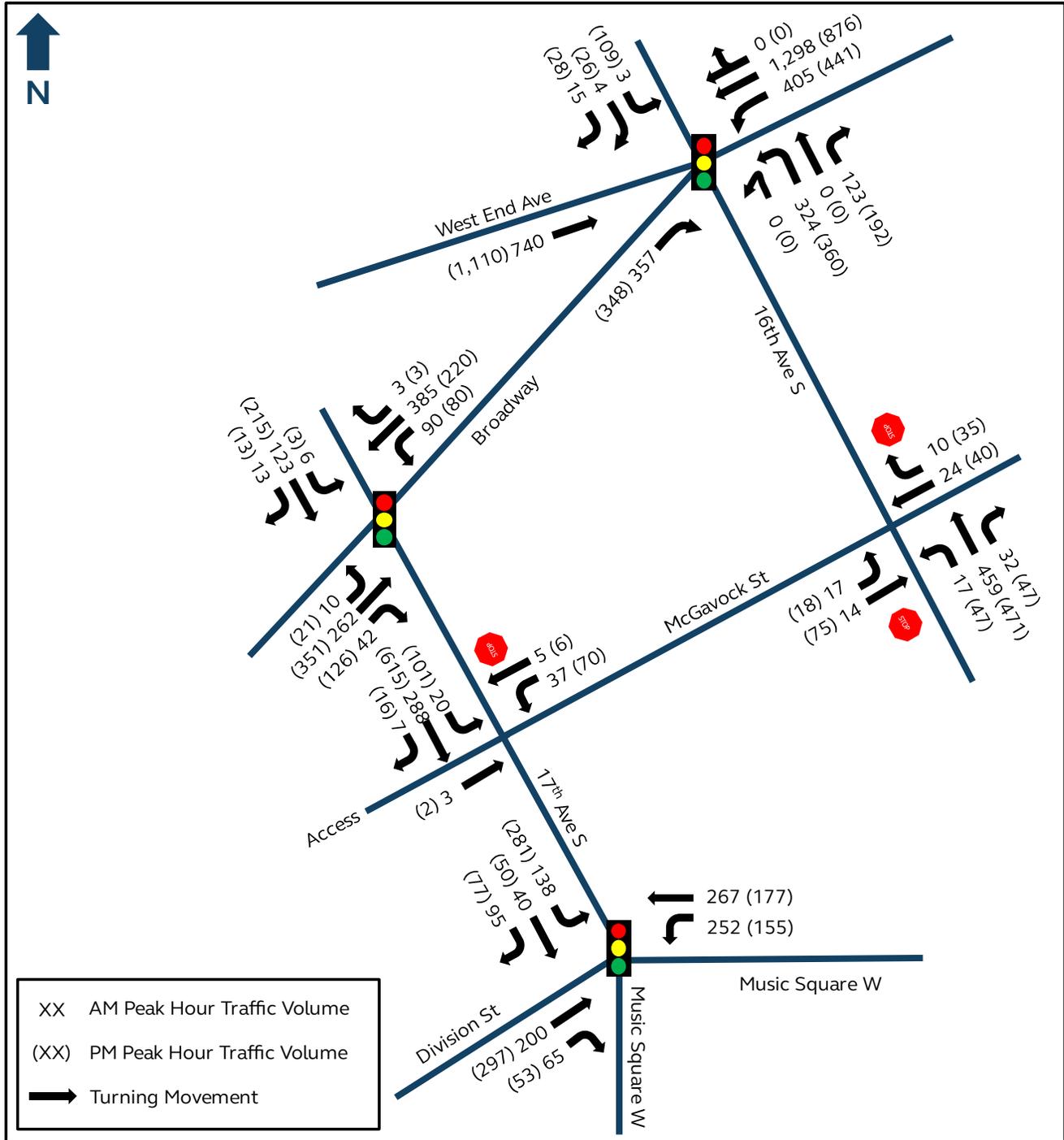
Figure 2.1 Existing 2023 Intersection Geometry



## 2.2 Existing Traffic Volumes

To provide data for the traffic review, turning movement counts were collected at each study intersection. All counts follow the guidance provided in Section 2.7 of the MMTA Guidelines.

Figure 2.2 Existing 2023 Peak Hour Traffic Volumes



## 2.3 Existing Traffic Level of Service

Existing traffic level of service analysis was conducted using the latest version of Synchro and summarized is in Table 2.1.

Table 2.1 Existing 2023 Peak Hour Traffic Level of Service

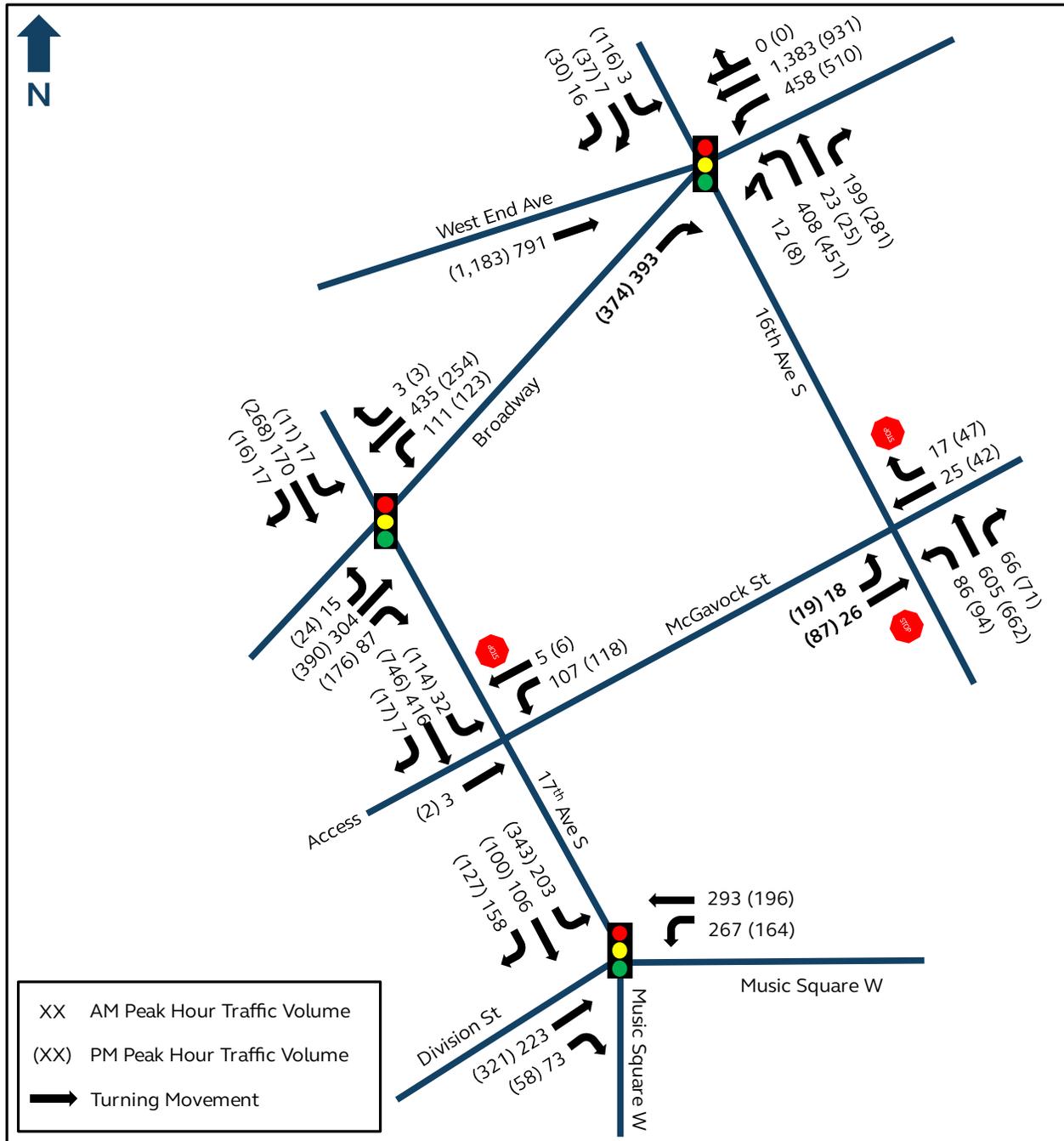
Intersection	Turning Movement	Level of Service (Average Delay in sec/veh)	
		AM Peak	PM Peak
1. Division Street and 17 <sup>th</sup> Avenue South / Music Square West	Overall	C (27.2)	C (28.8)
2. 17 <sup>th</sup> Avenue South and McGavock Street	EB	B (12.4)	C (22.9)
	WB	B (10.8)	C (16.7)
3. 16 <sup>th</sup> Avenue South and McGavock Street	EB	B (12.7)	C (19.0)
	WB	B (13.5)	C (15.2)
4. 17 <sup>th</sup> Avenue South and Broadway	Overall	A (7.8)	B (11.6)
5. Broadway / West End Avenue and 16 <sup>th</sup> Avenue South	Overall	D (33.8)	D (46.8)



## 2.4 Future No-Build Traffic Volumes

To account for background traffic growth, Existing 2023 traffic volumes were increased by 2.0% annually until the 2026 build year. Section 2.5 of the MMTA Guidelines and TDOT's AADT count stations were referenced to determine an acceptable background growth rate. The 2.0% background growth rate was approved by NDOT in the Scoping Evaluation Form (Form A).

Figure 2.3 Future 2026 No-Build Traffic Volumes



## 2.5 Future No-Build Traffic Level of Service

Future no-build traffic level of service analysis was conducted using the latest version of Synchro and summarized in Table 2.2.

Table 2.2 Future 2026 No-Build Peak Hour Traffic Level of Service

Intersection	Turning Movement	Level of Service (Average Delay in sec/veh)	
		AM Peak	PM Peak
1. Division Street and 17 <sup>th</sup> Avenue South / Music Square West	Overall	C (32.7)	D (41.7)
2. 17 <sup>th</sup> Avenue South and McGavock Street	EB	B (14.5)	D (29.0)
	WB	B (12.5)	C (22.3)
3. 16 <sup>th</sup> Avenue South and McGavock Street	EB	C (21.3)	E (44.7)
	WB	C (19.1)	C (23.3)
4. 17 <sup>th</sup> Avenue South and Broadway	Overall	A (9.4)	B (14.3)
5. Broadway / West End Avenue and 16 <sup>th</sup> Avenue South	Overall	D (37.1)	E (56.1)

## 2.6 Trip Generation

Traffic for the proposed development was calculated using the most recent version of the Institute of Transportation Engineers (ITE) *Trip Generation Manual* and supported by guidance in Section 2.1 of the MMTA Guidelines. Internal capture reductions were calculated using the most recent version of the *ITE Trip Generation Handbook* and supported by guidance in Section 2.2 of the MMTA Guidelines.

Table 2.3 Trip Generation

ITE Code	Land Use	Density	Peak Hour Trips		Daily Trips
			AM	PM	
222	Multifamily Housing (High-Rise)	450 units	118	140	2,070
822	Strip Retail Plaza (<40k sf)	15,000 square feet	39	105	862
932	High-Turnover (Sit-Down) Restaurant	15,000 square feet	144	137	1,608
<b>Gross Trips</b>			<b>301</b>	<b>382</b>	<b>4,540</b>
Internal Capture			-48 (-16%)	-156 (-41%)	-420 (-9%)
<b>Remaining Trips</b>			<b>253</b>	<b>226</b>	<b>4,120</b>



## 2.7 Mode Split

To account for non-vehicular trips generated by the development, such as pedestrian, bicycle, transit, and other micromobility transportation modes, 20% of total trips were attributed to transportation modes other than single occupancy vehicles. 20% of development trips are expected to be non-vehicular due to the surrounding land uses in the study area and relatively growing population density. Mode split was approved by NDOT in the Scoping Evaluation Form (Form A) and supported by guidance in Section 2.3 of the MMTA Guidelines.

Table 2.4 Mode Split

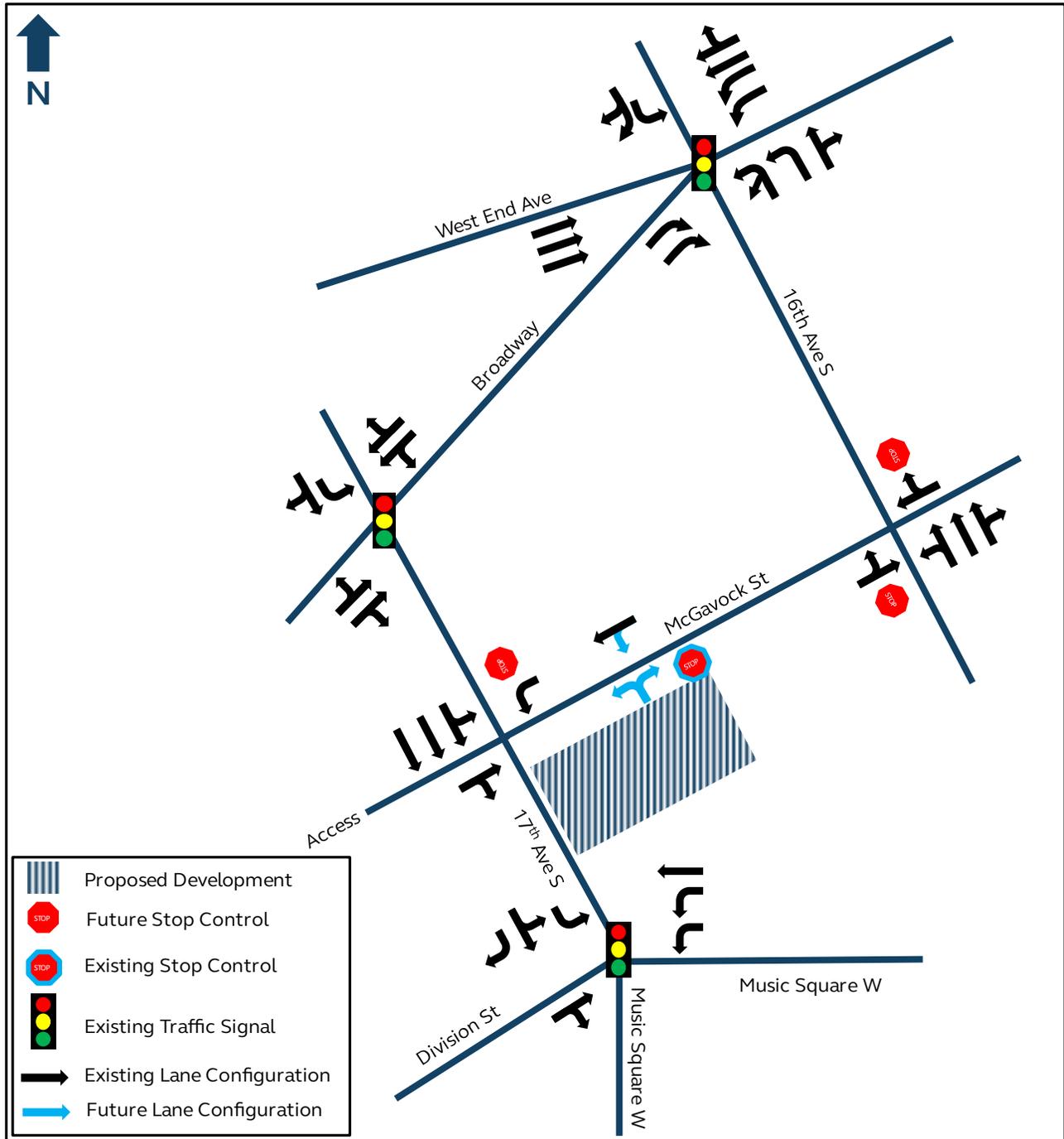
Parameter	AM Peak Hour		PM Peak Hour		Daily Trips	
Remaining Trips After Internal Capture Reduction	253		226		4,120	
Mode	Vehicular	Non-vehicular	Vehicular	Non-vehicular	Vehicular	Non-vehicular
Mode Split	80%	20%	80%	20%	80%	20%
Net Modal Trip Generation	202	51	181	45	3,296	824



## 2.8 Future Roadway Network

The future roadway network is illustrated in Figure 2.4.

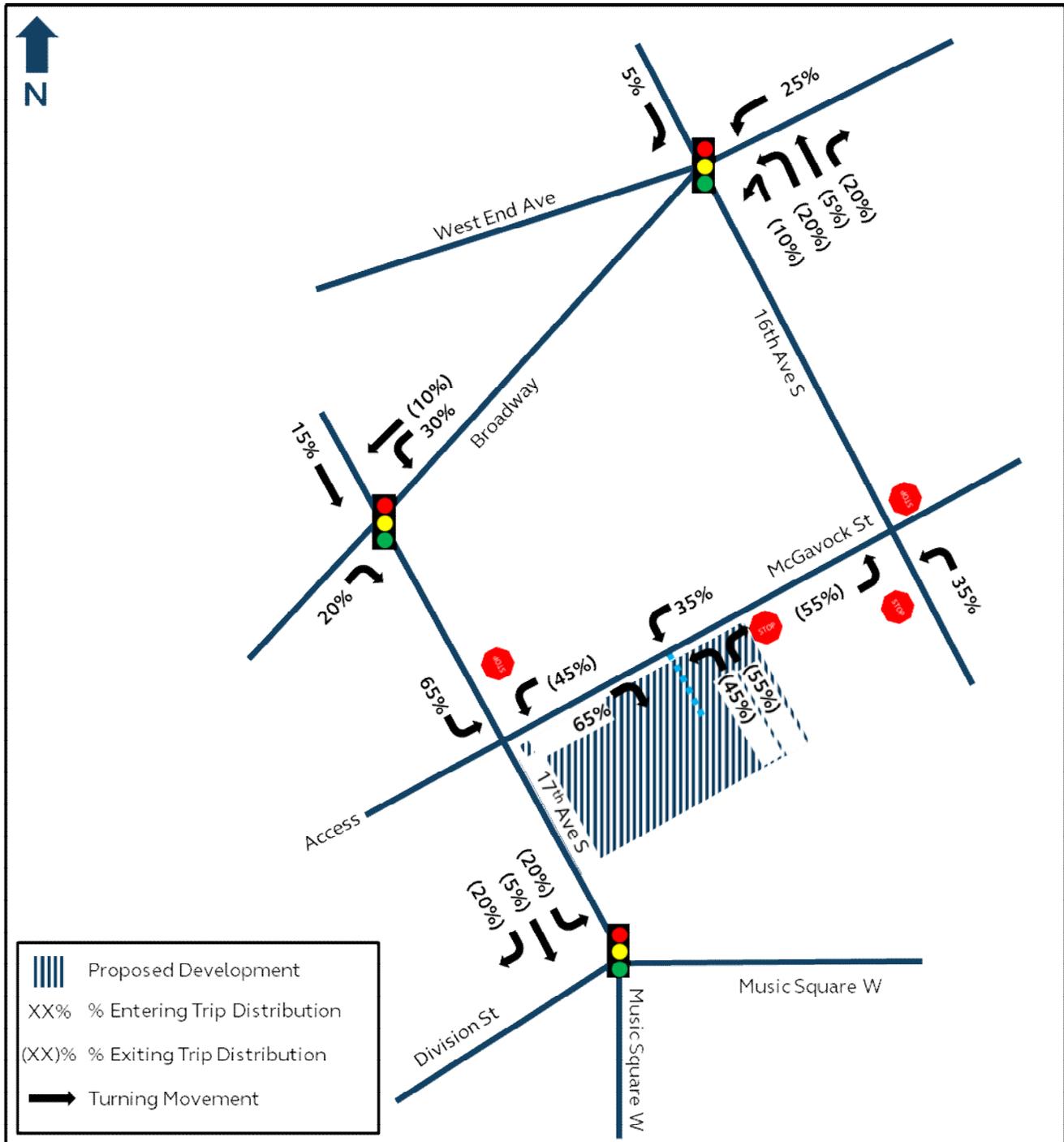
Figure 2.4 Future 2026 Build Intersection Geometry



## 2.9 Future Traffic Volumes

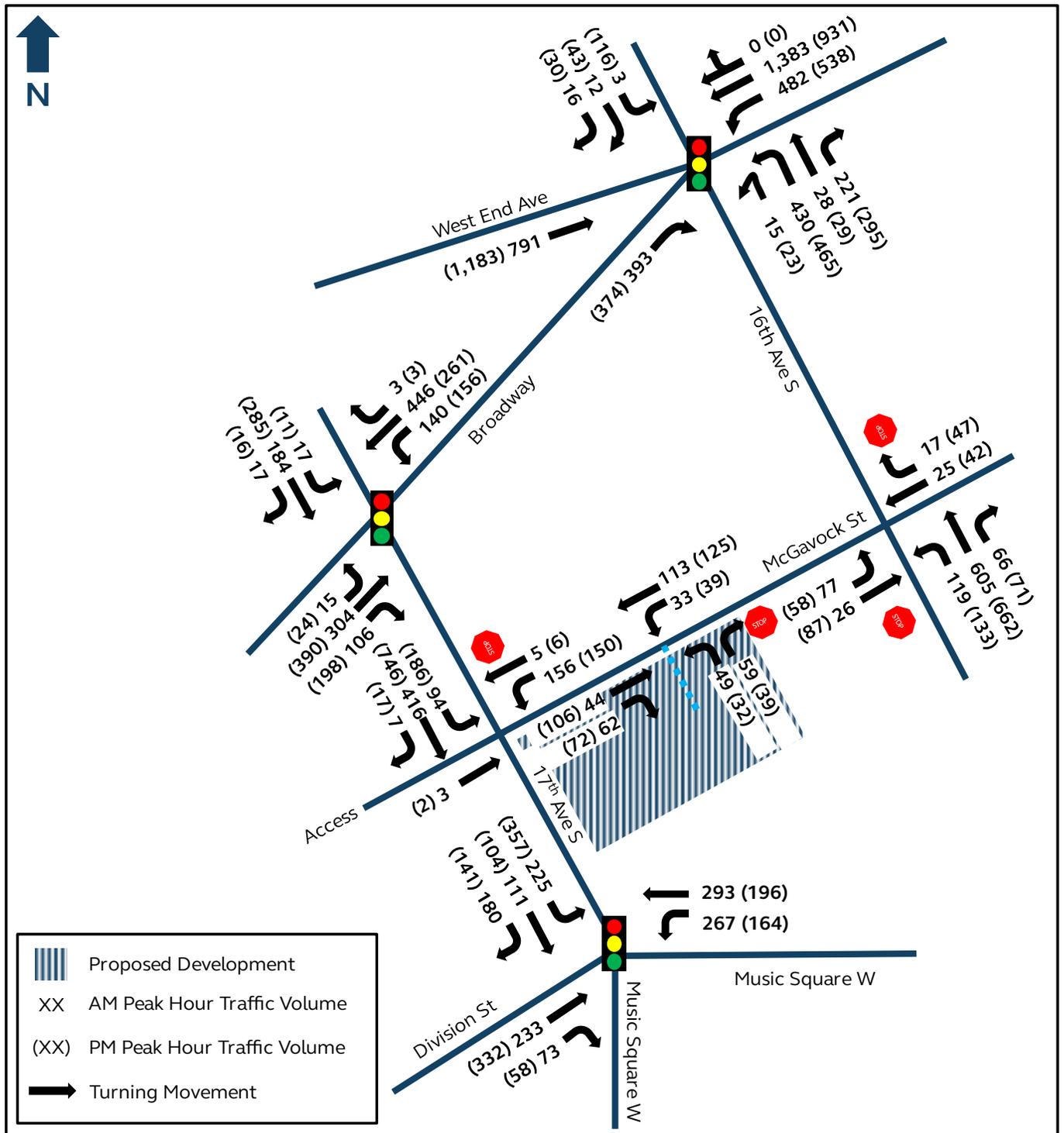
Future build scenario traffic volumes were calculated by adding expected development trips to the Future 2026 No-Build Scenario turning movement volumes. Expected development trip distribution is shown in Figure 2.5.

Figure 2.5 Trip Distribution



Expected vehicular trips on the transportation network in the 2026 build year is shown in Figure 2.6.

Figure 2.6 Future 2026 Build Peak Hour Traffic Volumes



## 2.10 Future Traffic Level of Service

Future build scenario traffic level of service analysis was conducted using the latest version of Synchro and summarized is in Table 2.5.

Table 2.5 Future 2026 Build Peak Hour Traffic Level of Service

Intersection	Turning Movement	Level of Service (Average Delay in sec/veh)	
		AM Peak	PM Peak
1. Division Street and 17 <sup>th</sup> Avenue South / Music Square West	Overall	C (34.8)	D (45.2)
2. 17 <sup>th</sup> Avenue South and McGavock Street	EB	C (17.7)	E (40.3)
	WB	C (17.3)	E (46.1)
3. 16 <sup>th</sup> Avenue South and McGavock Street	EB	D (26.3)	F (94.2)
	WB	C (21.4)	D (28.1)
4. 17 <sup>th</sup> Avenue South and Broadway	Overall	B (10.0)	B (15.2)
5. Broadway / West End Avenue and 16 <sup>th</sup> Avenue South	Overall	D (38.6)	F (88.1)
6. McGavock Street and Site Driveway 1	NB	B (10.1)	B (10.6)
	WBL	A (7.5)	A (7.7)



## 2.11 Traffic Level of Service Summary

The results of the traffic level of service analysis are summarized in Tables 2.6 and 2.7.

Table 2.6 AM Peak Hour Traffic Level of Service Summary

Intersection	Turning Movement	Existing 2023	Future 2026 No-Build	Future 2026 Build
1. Division Street and 17th Avenue South / Music Square West	Overall	C (27.2)	C (32.7)	C (34.8)
2. 17th Avenue South and McGavock Street	EB	B (12.4)	B (14.5)	C (17.7)
	WB	B (10.8)	B (12.5)	C (17.3)
3. 16th Avenue South and McGavock Street	EB	B (12.7)	C (21.3)	D (26.3)
	WB	B (13.5)	C (19.1)	C (21.4)
4. 17th Avenue South and Broadway	Overall	A (7.8)	A (9.4)	B (10.0)
5. Broadway / West End Avenue and 16th Avenue South	Overall	D (33.8)	D (37.1)	D (38.6)
6. McGavock Street and Site Driveway 1	NB	-	-	B (10.1)
	WBL	-	-	A (7.5)



Table 2.7 PM Peak Hour Traffic Level of Service Summary

Intersection	Turning Movement	Existing 2023	Future 2026 No-Build	Future 2026 Build
1. Division Street and 17th Avenue South / Music Square West	Overall	C (28.8)	D (41.7)	D (45.2)
2. 17th Avenue South and McGavock Street	EB	C (22.9)	D (29.0)	E (40.3)
	WB	C (16.7)	C (22.3)	E (46.1)
3. 16th Avenue South and McGavock Street	EB	C (19.0)	E (44.7)	F (94.2)
	WB	C (15.2)	C (23.3)	D (28.1)
4. 17th Avenue South and Broadway	Overall	B (11.6)	B (14.3)	B (15.2)
5. Broadway / West End Avenue and 16th Avenue South	Overall	D (46.8)	E (56.1)	F (88.1)
6. McGavock Street and Site Driveway 1	NB	-	-	B (10.6)
	WBL	-	-	A (7.7)



### 3 Multimodal Review

#### 3.1 Bicycle Network Compliance with NDOT Standards

There are no existing bicycle facilities in the study area. An evaluation of each study segment was conducted to determine the feasibility of aligning with desired roadway cross sections as described in the Major and Collector Street Plan (MCSP). **Due to the absence of bicycle facility plans, bicycle facility upgrades are not recommended with this development.**

##### Segment 1: 17<sup>th</sup> Avenue South between Division Street and McGavock Street

Segment 1 currently consists of three (3) southbound vehicular lanes and no bicycle facilities. The MCSP illustrates a preferred 60' ROW cross section consisting of two (2) southbound vehicular travel lanes and a vehicular parking lane. **No bicycle facilities are included in the MCSP cross section. If bicycle facilities are desired in the future, a vehicular travel lane could be converted.**

##### Segment 2: McGavock Street between 17<sup>th</sup> Avenue South and 16<sup>th</sup> Avenue South

Segment 2 currently consists of two (2) vehicular travel lanes and one (1) parking lane on the north side of the roadway. **This is in alignment with the cross section illustrated in the MCSP.**

##### Segment 3: 17<sup>th</sup> Avenue South between McGavock Street and Broadway

Segment 3 consists of the same existing cross section and MCSP cross section as Segment 1. **No bicycle facilities are included; however, a vehicular travel could be converted if bicycle facilities are desired in the future.**

##### Segment 4: Broadway between 17<sup>th</sup> Avenue South and 16<sup>th</sup> Avenue South

Segment 4 currently consists of two (2) eastbound and two (westbound) vehicular travel lanes and no bicycle facilities. **This is in alignment with the cross section illustrated in the MCSP.**

##### Segment 5: 16<sup>th</sup> Avenue South between Broadway and McGavock Street

Segment 5 currently consists of three (3) northbound vehicular lanes and no bicycle facilities. The MCSP illustrates a preferred 83' ROW cross section consisting of four (4) vehicular travel lanes, an 8' bike lane, and 4.5' of bike lane buffer. Existing ROW is approximately 51'. **The bicycle facilities illustrated in the MCSP are not feasible unless a significant amount of ROW is dedicated on the east side.** Since this outcome is highly unlikely, an existing vehicular travel lane could be converted if bicycle facilities are desired in the future.

#### 3.2 Pedestrian Network Compliance with NDOT Standards

##### Segment 1: 17<sup>th</sup> Avenue South between Division Street and McGavock Street

Figure 3.1 Segment 1 MCSP Compliance



Segment 1 currently consists of approximately 14' of combined sidewalk and buffer on the west side of the roadway and approximately 8.5' of sidewalk on the east side of the roadway. The MCSP illustrates a preferred 60' ROW cross section with 14' of combined sidewalk and buffer on either side of the roadway. The existing total ROW meets the preferred 60' cross section. Along site frontage, ***the developer should enhance the existing pedestrian facilities on the eastern side of the roadway to align with the MCSP cross section.***

**Segment 2: McGavock Street between 17th Avenue South and 16th Avenue South**

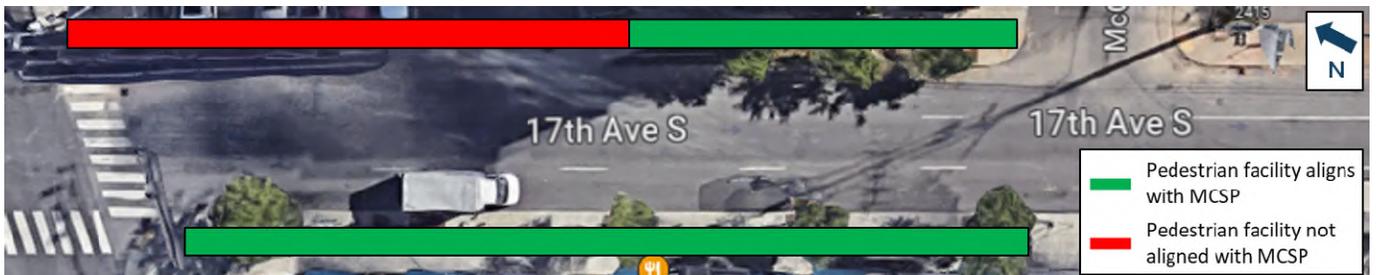
Figure 3.2 Segment 2 MCSP Compliance



Segment 2 currently consists of approximately 10' of combined sidewalk and buffer space on the north and south side of the roadway. The exact combination of sidewalk and buffer space varies along the segment. The MCSP illustrates a preferred 59' total ROW section with 10' of sidewalk and 4' of buffer on either side of the roadway. Existing total ROW is approximately 50', leaving a 9' differential between the existing and preferred cross section. To accommodate the full preferred ROW section, the developer must dedicate approximately 8' of ROW. ***The more likely and cost-effective option would be for the developer to dedicate at least half of the additional 9' of ROW to enhance pedestrian facilities along site frontage.***

**Segment 3: 17th Avenue South between McGavock Street and Broadway**

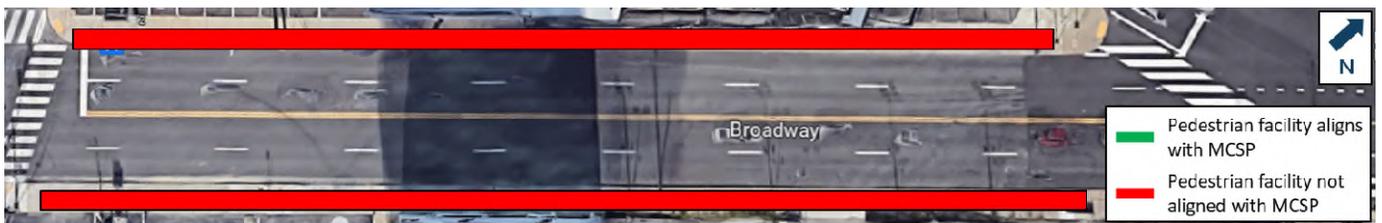
Figure 3.3 Segment 3 MCSP Compliance



Segment 3 currently consists of approximately the same pedestrian facilities as Segment 1. The sidewalk and buffer on the west side of the roadway aligns with the preferred MCSP cross section. The northern 110' of the sidewalk on the east side of the roadway is approximately 8' wide and is the only portion of the pedestrian facilities that deviates from the MCSP. Since Segment 3 is not part of site frontage and is rated PLTS 1, ***it is recommended that NDOT prioritize other pedestrian improvements.***

**Segment 4: Broadway between 17th Avenue South and 16th Avenue South**

Figure 3.4 Segment 4 MCSP Compliance



Segment 4 currently consists of a 10' sidewalk on either side of the roadway. The MCSP illustrates a preferred 74' total ROW cross section, including 16' of total sidewalk and buffer space on either side of the roadway. Existing total ROW is approximately 61', leaving a 13' ROW differential between the existing and preferred cross sections. Modifications to the pedestrian facilities along Segment 4 is not currently feasible. ***If the parcels on the north and south sides of the segment get developed in the future, NDOT can seek a ROW dedication to accommodate the preferred pedestrian facilities.***

**Segment 5: 16<sup>th</sup> Avenue South between Broadway and McGavock Street**

Figure 3.5 Segment 5 MCSP Compliance



Segment 5 currently includes sidewalk facilities of varying widths on each side of the roadway. The minimum width along this segment is approximately 8.5' of sidewalk, meeting the criteria for a PLTS 1. The MCSP illustrates a preferred 83' total ROW cross section consisting of a 10' sidewalk and 4' buffer on each side. Existing total ROW is 50'. The pedestrian facilities illustrated in the MCSP cannot be reasonably supported by this development. ***If adjacent parcels are developed in the future, significant ROW contributions could support pedestrian facility enhancements.***



### 3.3 Level of Traffic Stress Analysis

Figures 3.6 and 3.7 summarize the outcomes of the Level of Traffic Stress (LTS) Analysis. LTS ratings were assigned using the LTS flow charts provided in Appendix C of the MMTA Guidelines and supported by Sections 4.2.2 and 4.3.2 of the MMTA Guidelines.

Figure 3.6 Bicycle Level of Traffic Stress Aerial Map Summary



All study segments and intersections were assigned BLTS 4, except for McGavock Street, due to the absence of bicycle facilities in the study area. McGavock Street was assigned BLTS 3 due to the low posted speed limit and two-travel lane cross section.

Figure 3.7 Pedestrian Level of Traffic Stress Aerial Map Summary



All segments and intersections in the study area were rated PLTS 1 or PLTS 2 except for the intersections described below. The PLTS analysis suggests that study segments provide pedestrians with adequate safety and comfort, while intersections are the biggest obstruction to connectivity.

## Intersection 2

East-west crossings across 17<sup>th</sup> Avenue South, despite not being recognized as a pedestrian crossing and not supported by pedestrian infrastructure, were analyzed for PLTS due to the expectation that pedestrians will cross 17<sup>th</sup> Avenue South at this location. The nearest intersections (Intersection 1 and Intersection 4) are approximately 440' apart, less than the maximum recommended distance of 600' for pedestrian crossing spacing, however, a PLTS rating was assigned to indicate the need to better accommodate pedestrian crossings at this location.

Additionally, the crossing at the WB approach of McGavock Street poses increased risk to pedestrians due to the absence of a crosswalk, and free-flow left-turns into McGavock Street.

Table 3.1 Intersection 2 PLTS Rating

Intersection	Analysis	Weakest Link	Characteristics	Rating
2. 17 <sup>th</sup> Avenue South and McGavock Street	Pedestrian	SB approach crossing	Unsignalized intersection; 25 mph posted speed limit; stop controlled crossing; 2 vehicular lane crossing width	PLTS 4*

Figure 3.8 17th Avenue South and McGavock Street (Intersection 2)



## Intersection 3

A notable lack of adequate pedestrian crossing infrastructure across 16<sup>th</sup> Avenue South contributes to an unsafe environment for pedestrians at Intersection 3. PLTS 4 was assigned for the NB approach crossing. The EB and WB approach crossings are also lacking adequate pedestrian infrastructure.

Table 3.2 Intersection 3 PLTS Rating

Intersection	Analysis	Weakest Link	Characteristics	Rating
3. 16 <sup>th</sup> Avenue South and McGavock Street	Pedestrian	NB approach crossing	Unsignalized intersection; 25 mph posted speed limit; crossing not stop controlled; unknown AADT; 3-lane crossing width	PLTS 4



Figure 3.9 16th Avenue South and McGavock Street (Intersection 3)



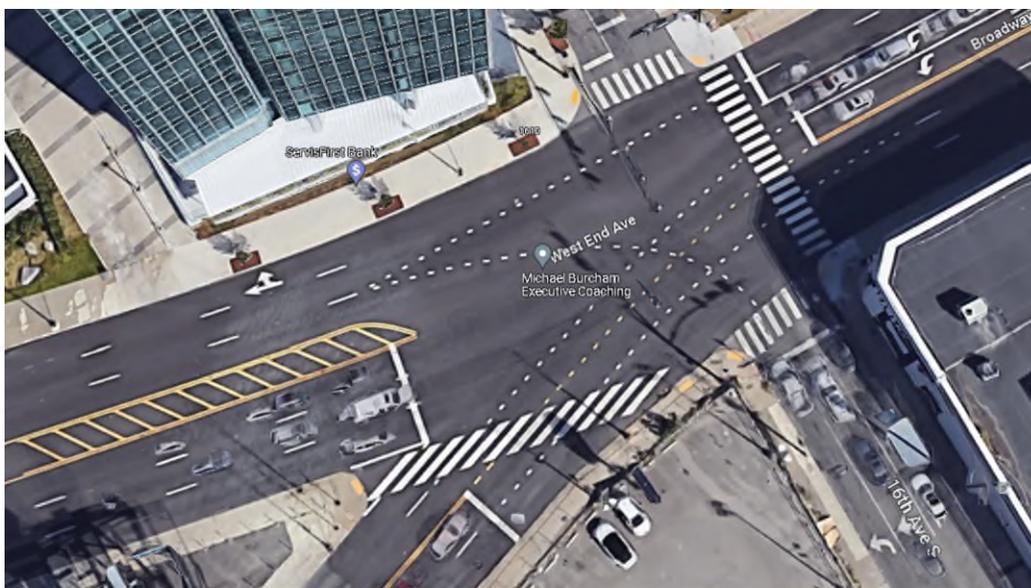
### Intersection 5

The intersection of Broadway / West End Avenue and 16<sup>th</sup> Avenue South was rated PLTS 3 due to the 7-lane pedestrian crossing along the WB approach. It should also be noted that the pedestrian crossing along the EB approach of Broadway creates an excessive pedestrian crossing distance.

Table 3.3 Intersection 5 PLTS Rating

Intersection	Analysis	Weakest Link	Characteristics	Rating
5. Broadway / West End Avenue and 16 <sup>th</sup> Avenue South	Pedestrian	WB approach crossing	Signalized intersection; 7-lane crossing width	PLTS 3

Figure 3.10 West End / Broadway and 16th Avenue South (Intersection 5)



### 3.4 Transit Stop Evaluation

Two transit stops in the study area were evaluated as part of the Multimodal Review. Figure 3.5 shows the location of the transit stops in relation to the development. Table 3.4 summarizes the transit stop evaluation. Guidance provided in Section 4.4 of the MMTA Guidelines and the most recent version of the WeGo Design guidelines was used to support the transit evaluation.

Figure 3.11 Study Area Transit Stop Location

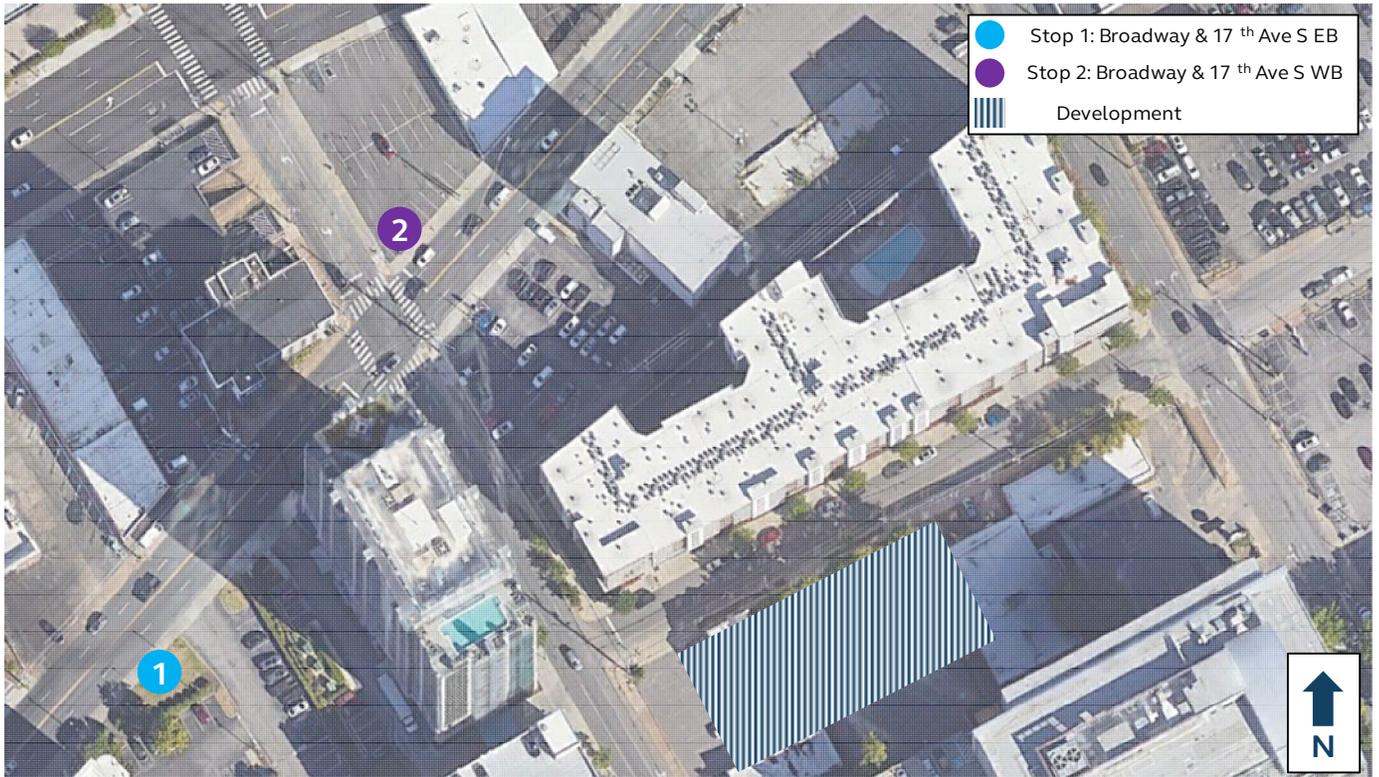


Table 3.4 Transit Stop Evaluation Summary

Transit Stop	Type	Upgrade?	Transit Stop Spacing	Transit Stop Design and ADA Compliance
Stop 1: Broadway & 17 <sup>th</sup> Ave S EB	Sign	No	Previous Stop: 0.19 miles Following Stop: 0.48 miles	Compliant
Stop 2: Broadway & 17 <sup>th</sup> Ave S WB	Bench	No	Previous Stop: 0.43 miles Following Stop: 0.20 miles	Compliant

WeGo Transit Design Guidelines states that benches should be installed at transit stops with 25 or more daily boardings. Average Fall 2022 boarding data obtained from WeGo’s public GIS layer and other criteria provided in Section 4.4.1 of the MMTA Guidelines demonstrate that the existing transit stop facilities are sufficient.

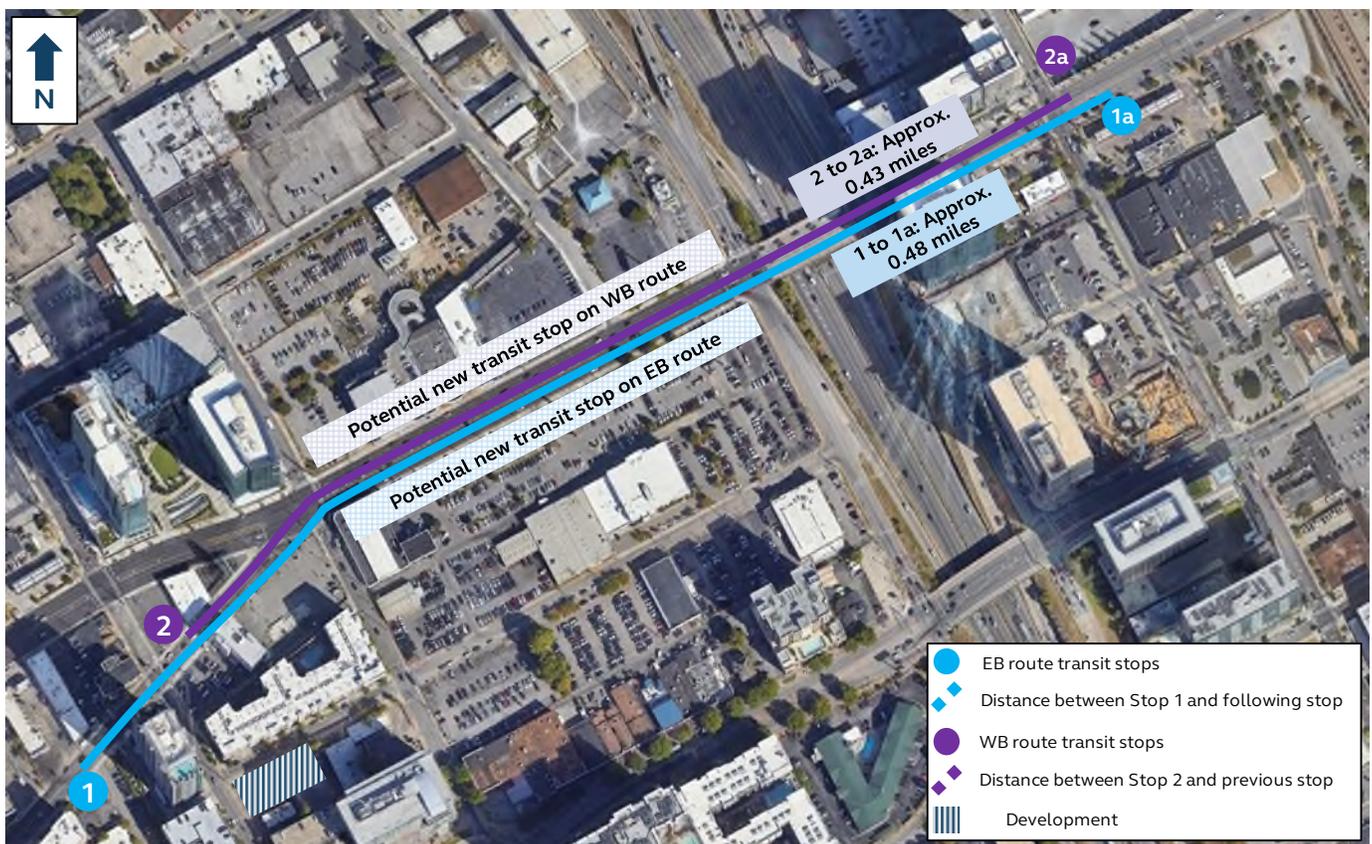


Table 3.5 Transit Stop Boardings and Alightings

Transit Stop	Average Daily Boardings	Average Daily Alightings
Stop 1: Broadway & 17 <sup>th</sup> Ave S EB	14.91	16.88
Stop 2: Broadway & 17 <sup>th</sup> Ave S WB	13.72	29.10

Each transit stop serves local route #7. WeGo Transit Design Guidelines recommend that transit stops serving local routes be spaced no more than 0.25 miles apart. The distance between adjacent stops to the east along each route are greater than the recommended distance for a local route. If new development is initiated in the surrounding area, WeGo should consider constructing additional stops along Broadway between 16<sup>th</sup> Avenue South and 14<sup>th</sup> Avenue South. Figure 3.12 summarizes the evaluation of stop spacing.

Figure 3.12 Transit Stop Spacing



### 3.5 Transit Stop Access Evaluation

Accessibility of each transit stop for future pedestrians using the new development was evaluated. A summary of the pedestrian path of travel is summarized in Figure 3.13.

Figure 3.13 Transit Stop Pedestrian Route Aerial Map



PLTS flow charts provided in the appendices of the MMTA Guidelines were used to calculate the average PLTS experienced by a pedestrian walking to each transit stop from the new development.

Table 3.6 Transit Stop 1 Access Evaluation

Segment	Length (ft)	Rating
McGavock St from site access to 17 <sup>th</sup> Ave S	125	PLTS 1
EB approach crossing of McGavock St at 17 <sup>th</sup> Ave S	30	PLTS 3
17 <sup>th</sup> Ave S from McGavock St to Broadway	215	PLTS 1
Southern leg crossing of 17 <sup>th</sup> Ave S and Broadway intersection	40	PLTS 2
Broadway from 17 <sup>th</sup> Ave S to Transit Stop 1	221	PLTS 1
<b>Weighted Average Rating</b>		<b>PLTS 1.2</b>

The total walking distance from the site access to Transit Stop 1 is 631 feet.



Table 3.7 Transit Stop 2 Access Evaluation

Segment	Length (ft)	Rating
McGavock St from site access to 17 <sup>th</sup> Ave S	125	PLTS 1
EB approach crossing of McGavock St at 17 <sup>th</sup> Ave S	30	PLTS 3
17 <sup>th</sup> Ave S from McGavock St to Broadway	215	PLTS 1
WB approach crossing of Broadway at 17 <sup>th</sup> Ave S	47	PLTS 2
Broadway from 17 <sup>th</sup> Ave S to Transit Stop 2	17	PLTS 1
<b>Weighted Average Rating</b>		<b>PLTS 1.2</b>

The total walking distance from the site access to Transit Stop 2 is 434 feet. A summary of the findings of the Transit Access Analysis is shown in Table 3.8.

Table 3.8 Transit Stop Access Evaluation Summary

Transit Stop	Route Distance (feet)	Average PLTS	Distance on PLTS 4 Facilities (feet)	Number of Crossing Rated PLTS 4	Is Transit Stop on PLTS 4 Facility? (Y/N)
1. Broadway and 17 <sup>th</sup> Ave S EB	631	1.2	0	0	N
2. Broadway and 17 <sup>th</sup> Ave S WB	434	1.2	0	0	N

The entire paths of travel to each transit stop were rated PLTS 1 and 2, except for the crossing of the EB approach of McGavock Street at 17<sup>th</sup> Avenue South. As previously discussed, the addition of pedestrian infrastructure at this intersection would significantly improve safety, comfort, and access for pedestrians. Recommendations to address this are describe in Section 5.



## 4 Safety Review

The safety review includes an evaluation of vehicular movements at the site access and crashes within the study area.

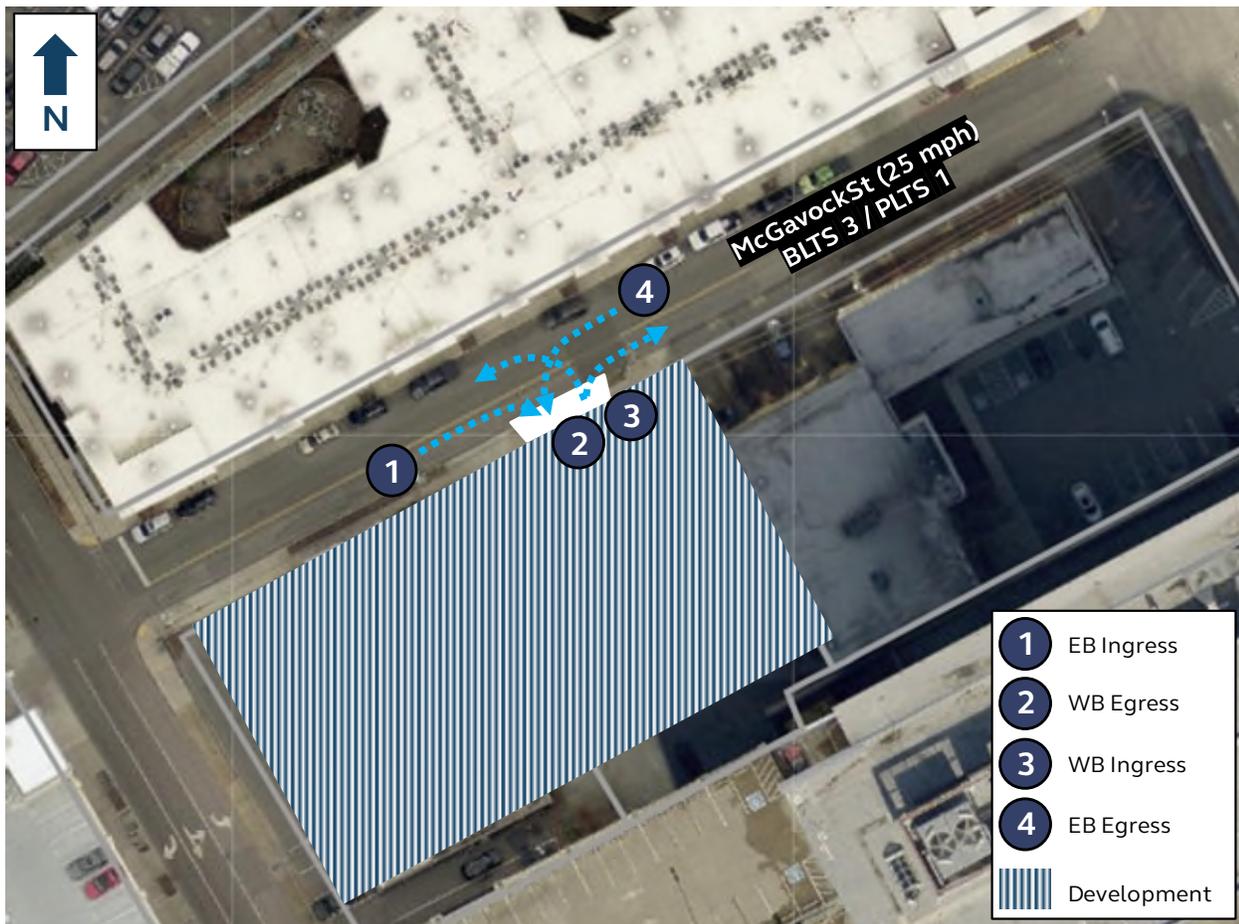
### 4.1 High Injury Network

Nashville's High Injury Network (HIN) consists of streets with the highest numbers of people who have died or been injured in a traffic crash. The only segment within the study area that is on the HIN is Broadway between 17<sup>th</sup> Avenue South and 16<sup>th</sup> Avenue South. This segment was assigned a "Medium" ranking, indicating the crash risk is moderate compared to other segments on the HIN.

### 4.2 Site Access Evaluation

The development has a single full access on McGavock Street, approximately 165 feet from 17<sup>th</sup> Avenue South.

Figure 4.1 Site Access Vehicular Movements

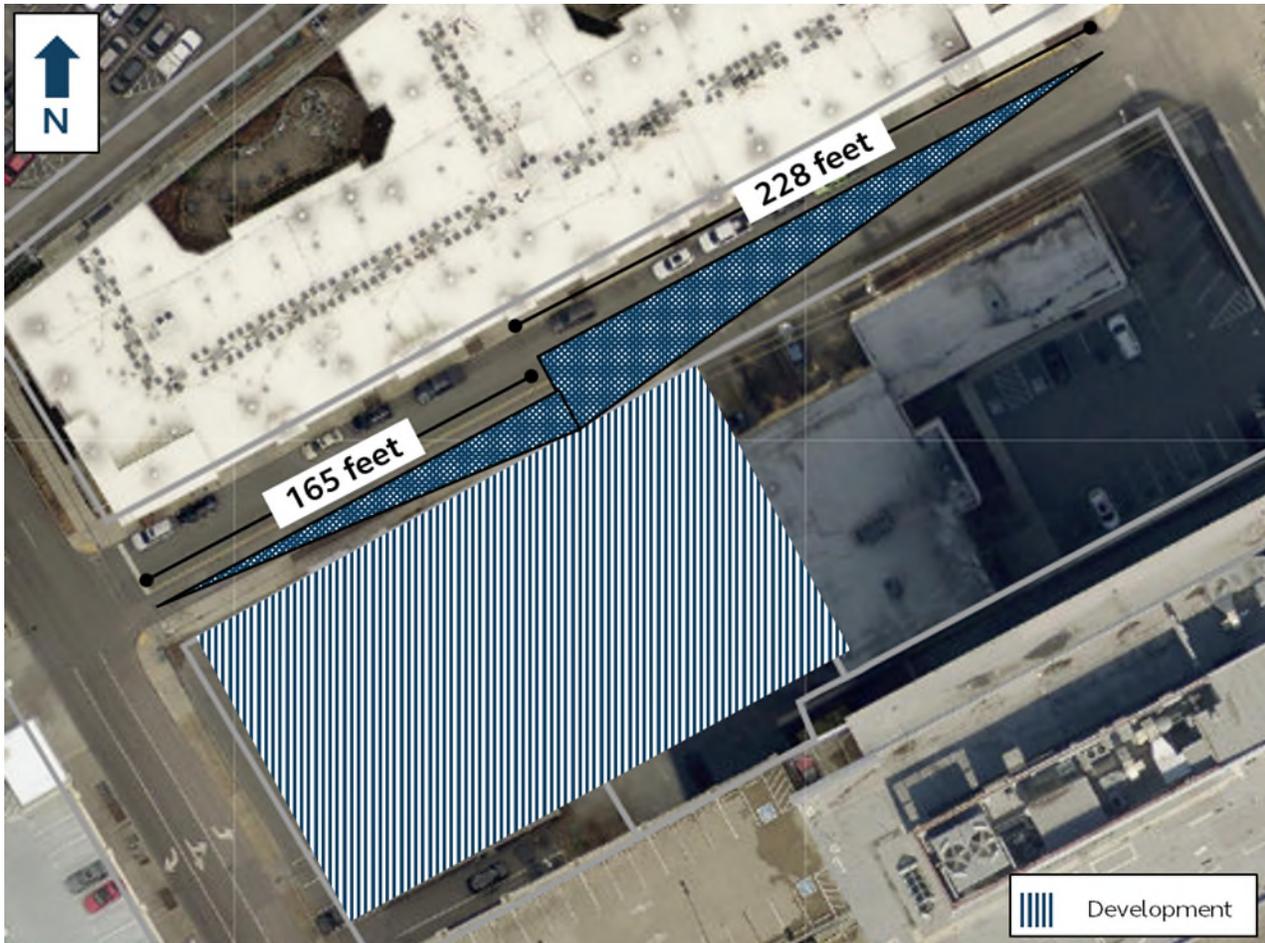


McGavock Street is a two-lane, 25 mph road with vehicular parking on the north side, opposite the access. Vehicular ingress and egress movements cross a sidewalk on the south side of the roadway.

The AASHTO Green Book recommends a stopping sight distance of 115 feet for a 25-mph roadway, which is met in both directions at this access.



Figure 4.2 Site Access Sight Distance



There are no expected high risk conflict points at this access due to the low posted speed limit, low AADT, and good visibility at this access.



## 4.3 Historical Crash Evaluation

Historical crash data in the study area was pulled from the AASHTOWare Safety Data Warehouse and provided by NDOT. The crash data used in this analysis was collected over 5 years between January 1<sup>st</sup>, 2018 and December 31<sup>st</sup>, 2022. Figure 4.3 illustrates the crash locations throughout the study area.

Figure 4.3 Study Area Crash History Summary

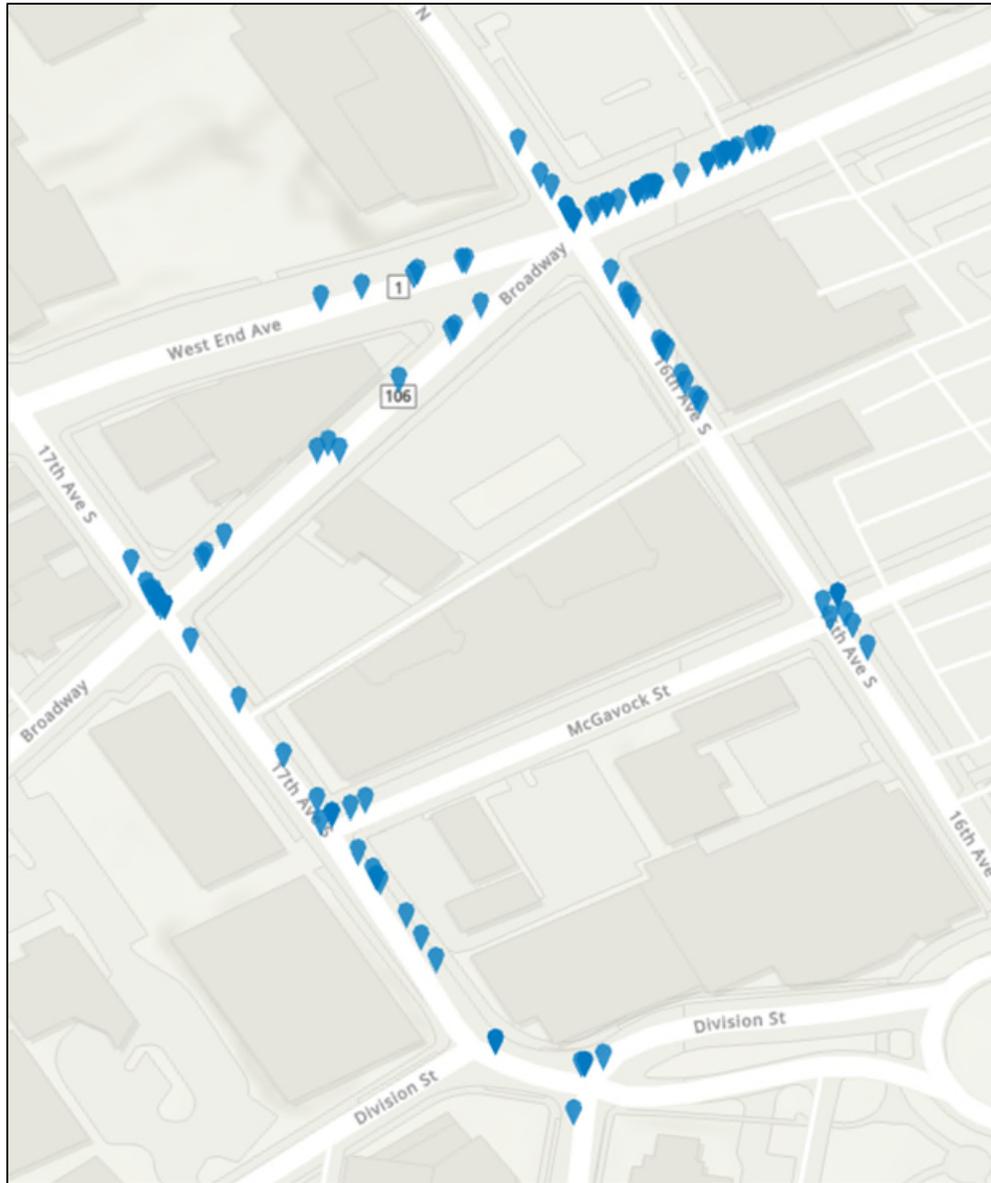


Table 4.1 categorizes the crashes by severity. According to the AASHTOWare database, 261 crashes occurred in the study area between January 2018 and December 2022, with approximately 1.1% resulting in a suspected serious injury, 19.5% resulting in a suspected minor injury, 6.5% resulting in a possible injury, and 72.0% resulting in only property damage.

*Table 4.1 Crash Severity Summary*

Year	Total Crashes	Crash Severity				
		Fatal	Serious Injury	Minor Injury	Possible Injury	Property-Damage Only
2022	57	-	1	17	10	29
2021	32	-	2	4	2	24
2020	34	-	-	4	2	28
2019	79	-	-	12	3	64
2018	59	-	-	14	-	43
<b>Sum</b>	<b>261</b>	<b>-</b>	<b>3</b>	<b>51</b>	<b>17</b>	<b>188</b>

Of the 261 total crashes, 156 (59.8%) occurred at intersections and 105 occurred along roadways (40.2%). There were 222 crashes involving two vehicles. Of those 222 crashes, approximately 2% were head on, 16% were rear-ends, 56% were angled, and 26% were sideswipes. In addition, there were also 5 crashes involving a pedestrian or other non-motorist. Table 4.2 summarizes the location and type of crashes in the study area.

*Table 4.2 Crash Location and Type Summary*

Year	Total Crashes	Crash Location		Crash Type							
		At an Intersection	Along Roadway	Crash involving two vehicles				Crash involving one vehicle			Other/Unknown
				Head On	Rear-End	Angle	Sideswipe	Pedestrian Involved	Other Non-Motorist	Property	
2022	57	29	28	1	7	37	5	2	1	1	3
2021	32	19	13	1	2	18	8	-	-	1	2
2020	34	17	17	1	6	11	7	-	-	2	7
2019	79	55	24	-	10	33	25	1	-	-	10
2018	59	36	23	1	10	26	13	1	-	4	4
<b>Sum</b>	<b>261</b>	<b>156</b>	<b>105</b>	<b>4</b>	<b>35</b>	<b>125</b>	<b>58</b>	<b>4</b>	<b>1</b>	<b>8</b>	<b>26</b>



An intersection crash analysis was conducted using AASHTOWare data and peak hour traffic counts collected in the field. The purpose of analyzing each study intersection is to understand the relative crash risk of a study intersection and identify potential crash hotspots. The crash rate estimations in Table 4.3 are likely conservative due to the application of the K factor and reduced traffic volumes due to COVID-19. More information on the methodology can be found in the MMTA Guidelines.

The resulting crash rates are estimations; however, consistent application of the methodology allows for conclusions to be drawn from the relative crash rate of each intersection. The analysis revealed that the intersection of 17<sup>th</sup> Avenue South and Broadway had the highest intersection crash rate (3.16), followed by Division Street and 17<sup>th</sup> Avenue South / Music Square West (0.60), and 17<sup>th</sup> Avenue South and McGavock Street.

*Table 4.3 Intersection Crash Analysis*

Intersection	Total Crashes	Peak Hour Entering Volume*	K factor	Daily volume	Total entering volume**	Crashes per million entering vehicles
1. Division Street and 17 <sup>th</sup> Avenue South / Music Square West	17	1090	7%	15,571	28,417,075	0.60
2. 17 <sup>th</sup> Avenue South and McGavock Street	11	810	7%	11,571	21,117,075	0.52
3. 16 <sup>th</sup> Avenue South and McGavock Street	8	733	7%	10,471	19,109,575	0.42
4. 17 <sup>th</sup> Avenue South and Broadway	85	1032	7%	14,743	26,905,975	3.16
5. Broadway / West End Avenue and 16 <sup>th</sup> Avenue South	35	3490	7%	49,857	90,989,025	0.38

*\*Peak hour entering volume is the greatest peak hour entering volume (AM or PM) on the day of traffic count collection*

*\*\*Total entering volume is the estimated number of vehicles entering the intersection during the time the crash data was collected (01/01/2018-12/31/2022)*



In total, there were four recorded crashes involving pedestrians, with one resulting in a suspected serious injury. A summary of pedestrian crashes is provided in Table 4.4.

*Table 4.4 Pedestrian Crash Summary*

Date	Type	Location	Severity	Driver Actions	Vehicle Direction	Conditions
12/16/2018 (Tuesday)	Pedestrian	17th Avenue South and Broadway	Suspected Minor Injury	Failure to Yield Right of Way	North	Clear; Daylight
03/02/2019 (Saturday)	Pedestrian	Division Street and 17th Avenue South / Music Square West (Intersection)	Suspected Minor Injury	Unknown	East	Cloudy; Daylight
07/06/2022 (Wednesday)	Other Non-Motorist	Broadway / West End Avenue and 16 <sup>th</sup> Avenue South (Along Roadway)	Suspected minor injury	No contributing actions	East	Clear; Daylight
08/27/2022 (Saturday)	Pedestrian	Broadway / West End Avenue and 16 <sup>th</sup> Avenue South (Intersection)	Suspected serious injury	No contributing actions	West	Clear; Dark-Lighted
10/27/2022 (Thursday)	Pedestrian	Broadway / West End Avenue and 16 <sup>th</sup> Avenue South (Intersection)	Suspected minor injury	No contributing actions	East	Clear; Daylight



Figure 4.4 shows the location of pedestrian crashes occurring in the study area.

Figure 4.4 Pedestrian Crash Location



While there were no fatal crashes in the study area, Table 4.5 provides a summary of four crashes that resulted in a suspected serious injury.

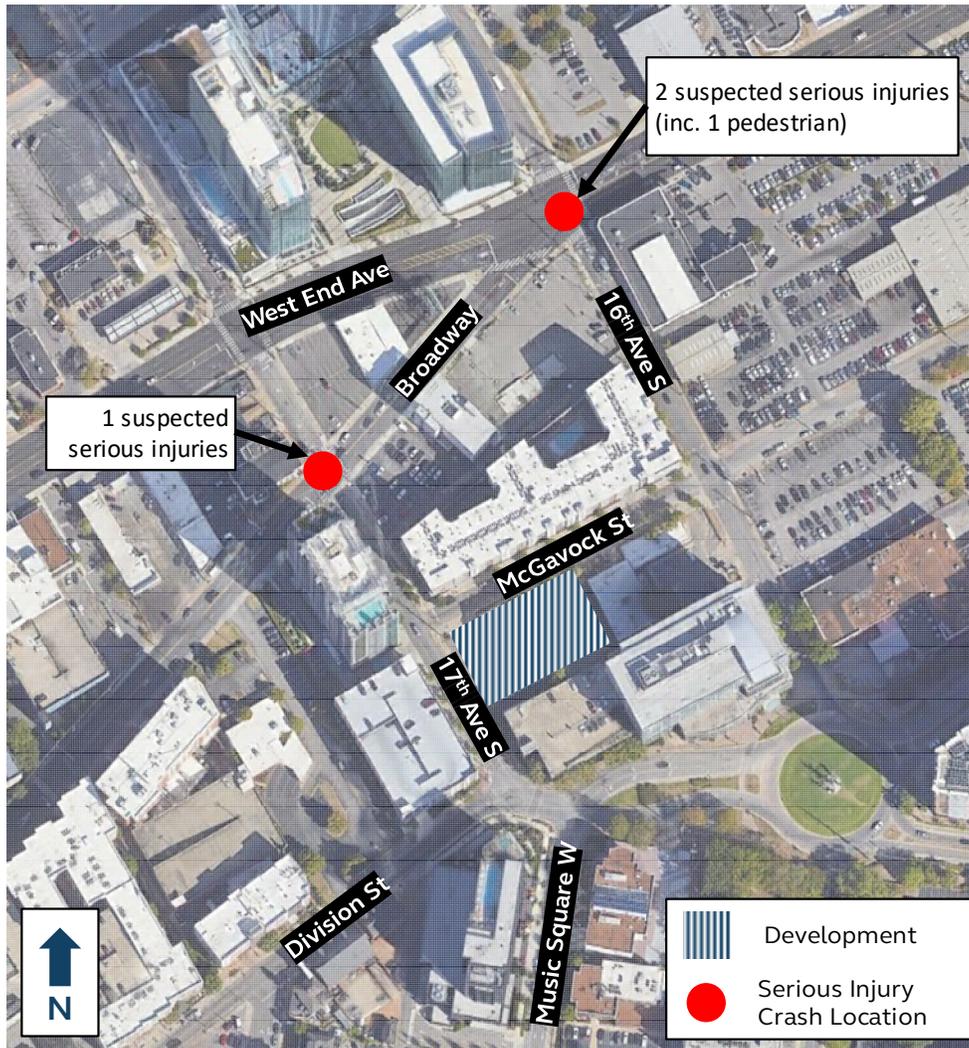
*Table 4.5 Suspected Serious Injury Crash Summary*

<b>Date</b>	<b>Location</b>	<b>Type</b>	<b>Driver Actions</b>	<b>Vehicle Direction(s)</b>	<b>Conditions</b>
11/20/2021 (Saturday)	17 <sup>th</sup> Avenue South and Broadway (intersection)	Angle (Vehicle/Vehicle)	No contributing actions/Unknown	East/South	Clear; Dark-Lighted
12/19/2021 (Sunday)	Broadway / West End Avenue and 16 <sup>th</sup> Avenue South (Along Roadway)	Angle (Vehicle/Vehicle)	No contributing actions/no contributing actions	North/West	Clear; Daylight
08/27/2022 (Saturday)	Broadway / West End Avenue and 16 <sup>th</sup> Avenue South (Intersection)	Pedestrian	No contributing actions	West	Clear; Dark-Lighted



Figure 4.5 illustrates the location of the serious injury crashes that occurred in the study area.

Figure 4.5 Serious Injury Crash Locations



The safety analysis highlighted the need for safety-focused improvements in the study area. Specifically, Metro should consider ways to enhance the intersection of 17<sup>th</sup> Avenue South and Broadway, and the intersection of West End / Broadway and 16<sup>th</sup> Avenue South, where a greater share of pedestrian and suspected serious injury crashes occurred.



# 5 Conclusion

The analysis presented in this MMTA provided the following findings:

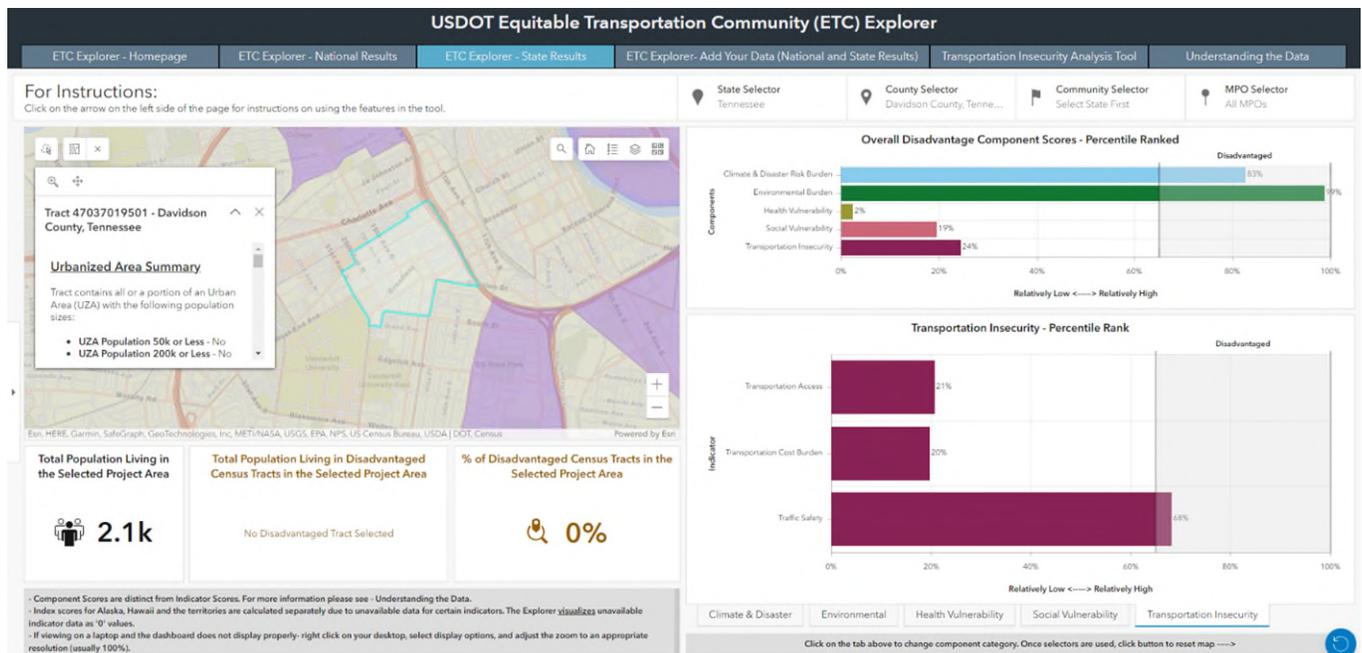
- Traffic performance is performing well in the study area and is not expected to excessively deteriorate with the proposed development.
- Transit facilities in the study are in good condition. Pedestrians have safe and comfortable access to both transit stops from the proposed development.
- There are multiple instances of inadequate pedestrian and bicycle infrastructure in the study area. While there are no planned bicycle facilities, pedestrian connectivity should be improved through the enhancement of existing facilities and installation of infrastructure.
- Crashes were concentrated at the intersection of 17<sup>th</sup> Avenue South and Broadway and Broadway / West End and 16<sup>th</sup> Avenue South.

The mitigation measures provided in this section are focused on addressing the findings of this MMTA.

## 5.1 Community Needs

It is important to consider community needs when determining mitigation measures, since community needs often dictate the effectiveness of new transportation facilities or designs. Metrics were reviewed using the US Department of Transportation’s Equitable Transportation Community (ETC) Explorer tool. Specifically, an area including the proposed development was reviewed, shown in Figure 5.1.

Figure 5.1 USDOT Equitable Transportation Community Explorer Tool



According to USDOT data, the area (Tract 47037019501) has a population of 2,100. Table 5.1 summarizes additional metrics that should be considered when implementing improvements to the transportation network.



Table 5.1 USDOT ETC Explorer Metrics

Metric	Value
Total Population Living in the Area	2.1k
Median Household Income	\$70,231
Poverty Level*	27.46%
Transportation Cost Burden	13.31%
Housing Cost Burden	54.72%
Number of Car-less Households	6.2%
Estimated Drive Distance to Grocery Stores	3 minutes
Estimated Drive Distances to Medical Facilities	2 minutes

\*Poverty level indicates the population at or below 200% of the federal poverty line

The visualization provided by the ETC Explorer tool shows that while transportation access is relatively high, and transportation cost burden is relatively low in the area, traffic safety remains an issue for community members.

The prevalence of car-less households and the availability of services such as grocery stores encourages walkability, underscoring the importance of adequate multimodal infrastructure in the study area.



## 5.2 Mitigation Measures

Table 5.1 summarizes potential improvements to the transportation network that address the outcomes of the traffic, multimodal, and safety analysis conducted as part of this MMTA.

Table 5.2 Recommended Improvements

#	Description	Location	Benefit
1	HAWK installation and additional pedestrian infrastructure	Intersection 2 (17 <sup>th</sup> Ave S and McGavock St) and Intersection 3 (16 <sup>th</sup> Ave S and McGavock St)	Improved PLTS, pedestrian connectivity, and transit access
2	Consolidate accesses along frontage	Segment 1 (17th Avenue South between Division Street and McGavock Street)	Improved PLTS
3	Reduce pedestrian crossing distance at EB approach of Broadway at 16 <sup>th</sup> Ave S	Intersection 5 (Broadway / West End Avenue and 16 <sup>th</sup> Avenue South)	Reduce pedestrian crossing distance
4	Dedicate ROW along McGavock St to accommodate pedestrian enhancements	Segment 2 (McGavock Street between 17th Avenue South and 16th Avenue South)	Improve pedestrian facilities
5	Leading Pedestrian Intervals (LPIs)	Intersection 4 (17 <sup>th</sup> Avenue South and Broadway) and Intersection 5 (Broadway / West End Avenue and 16 <sup>th</sup> Avenue South)	Improve pedestrian safety
6	Geometry and signal timing modifications	Intersection 4 (17 <sup>th</sup> Avenue South and Broadway)	Improve safety

From the list of recommended improvements, four mitigation measures have been identified and committed to by the development. The table below summarizes the recommended mitigation measures. The establishment of each rational nexus provides a logical connection between the anticipated impact of the new development and the proposed mitigation measure.



Table 5.3 Recommended Mitigation Measures

#	Description	Location	Rational Nexus	Cost	Commitment
1	HAWK installation and additional pedestrian infrastructure	Intersection 2 (17 <sup>th</sup> Ave S and McGavock St)	Improve pedestrian safety and connectivity in an area with a high share of pedestrian trips. A significant share of pedestrian trips generated by the development will pass through this intersection.	\$50,000 - \$150,000 (each)	Full build
2	Consolidate accesses along frontage	Segment 1 (17th Avenue South between Division Street and McGavock Street)	Improve safety and comfort along project frontage	TBD	Full completion
3	Reduce pedestrian crossing distance at EB approach of Broadway at 16 <sup>th</sup> Ave S	Intersection 5 (Broadway / West End Avenue and 16 <sup>th</sup> Avenue South)	Provide safe pedestrian connectivity in an area with a high share of pedestrian trips	TBD	Full funding and design support
4	Dedicate ROW along McGavock St to accommodate pedestrian enhancements	Segment 2 (McGavock Street between 17th Avenue South and 16th Avenue South)	Development frontage; provide safe and comfortable pedestrian infrastructure	N/A	Full dedication

Figure 5.2 depicts the recommended improvements at the intersection of 17<sup>th</sup> Avenue South and McGavock Street. To improve pedestrian safety, it is recommended that Rectangular Rapid Flashing Beacons (RRFBs) are installed at the intersection, in addition to new crosswalks and curb ramps with warning mats. A curb extension should be installed as depicted in the figures to slow vehicular speeds when turning. It is recommended that the curb extension be implemented with new paint and vertical delineators.



Figure 5.2 Recommended Improvements at Intersection 2

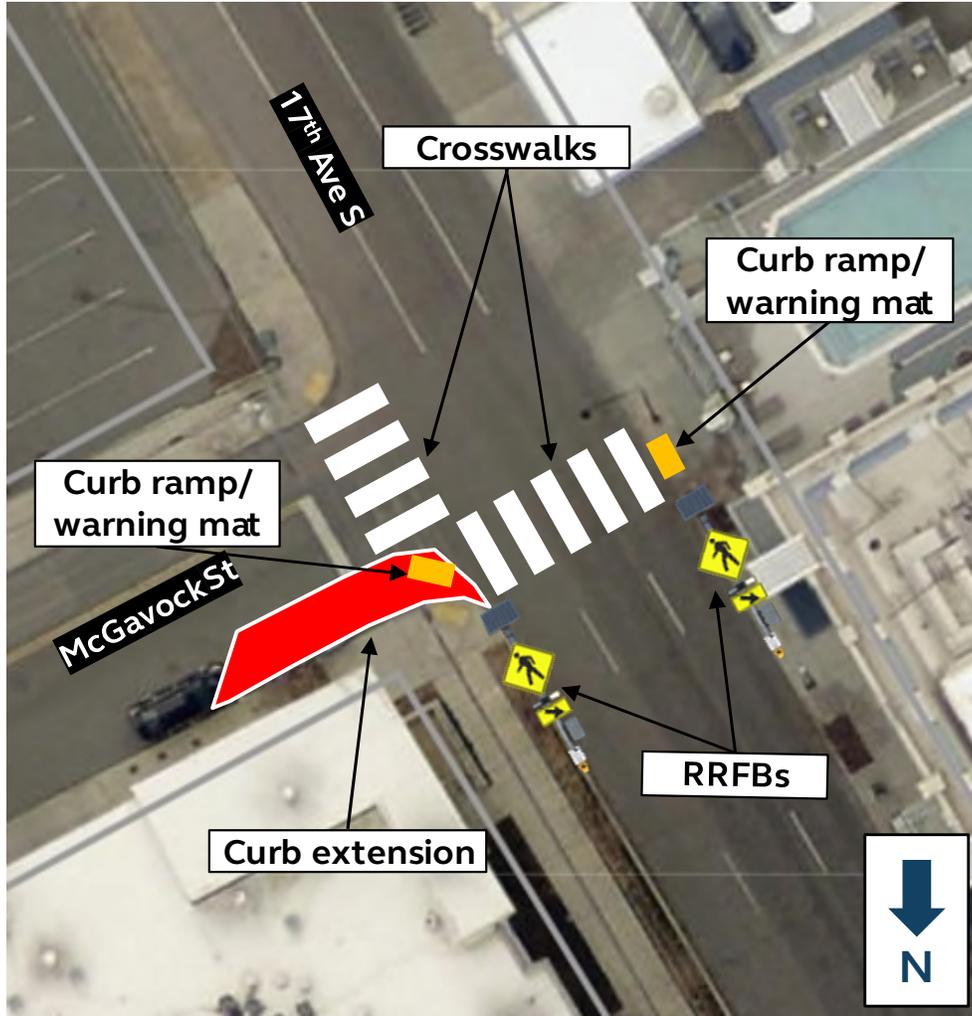
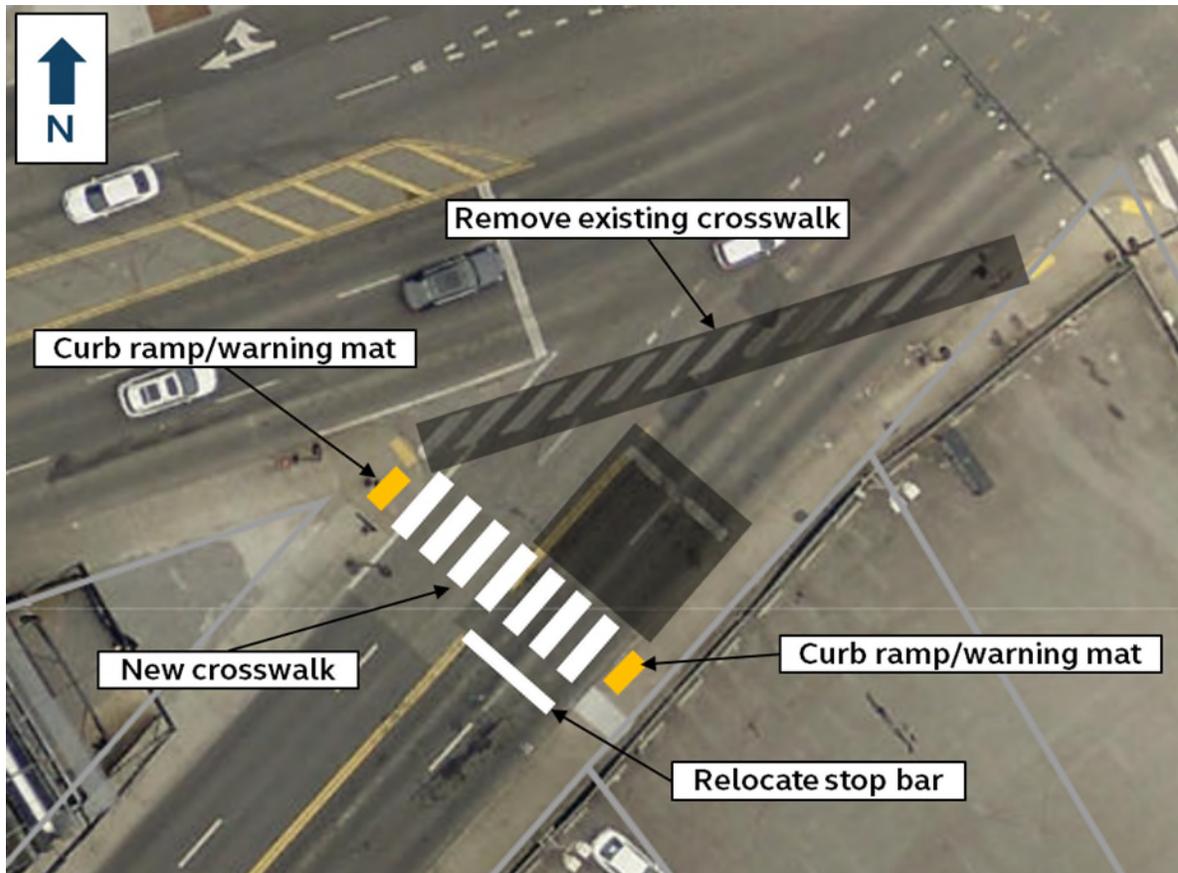


Figure 5.3 depicts the recommended relocation of the crosswalk across the EB approach of Broadway at the intersection of West End / Broadway and 16<sup>th</sup> Avenue South. This relocation would reduce the crossing distance from approximately 103' to 42' (61' total reduction in crossing distance).

Figure 5.3 Crosswalk Relocation at Intersection 5



The selected mitigation measures are purposeful, logically connected to the development's impact, and contribute to the improvement of the transportation network in a manner that benefits both the community and the development in alignment with Metro plans.



# Appendix A: Level of Traffic Stress Ratings

## Segment Level of Traffic Stress

### Segment 1 LTS Analysis

Segment	Analysis	Weakest Link	Characteristics	Rating
1. 17 <sup>th</sup> Avenue South between Division Street and McGavock Street	Bicycle	N/A	Mixed traffic; 25 mph speed limit; 3 vehicular travel lanes	BLTS 4
	Pedestrian	N/A	8' sidewalk; 25 mph speed limit; excessive curb cuts	PLTS 2*

\*Excessively long curb cuts (adjusted PLTS 1 to PLTS 2)

### 17th Avenue South between Division Street and McGavock Street



### Segment 2 LTS Analysis

Segment	Analysis	Weakest Link	Characteristics	Rating
2. McGavock Street between 17 <sup>th</sup> Avenue South and 16 <sup>th</sup> Avenue South	Bicycle	N/A	Mixed traffic; 25 mph speed limit; 2 vehicular travel lanes; mixed surrounding land use	BLTS 3
	Pedestrian	N/A	8' sidewalk; 25 mph speed limit	PLTS 1



McGavock Street between 17th Avenue South and 16th Avenue South



Segment 3 LTS Analysis

Segment	Analysis	Weakest Link	Characteristics	Rating
3. 17 <sup>th</sup> Avenue South between McGavock Street and Broadway	Bicycle	N/A	Mixed traffic; 25 mph speed limit; 3 vehicular travel lanes	BLTS 4
	Pedestrian	N/A	8' sidewalk; 25 mph speed limit	PLTS 1

17th Avenue South between McGavock Street and Broadway



Segment 4 LTS Analysis

Segment	Analysis	Weakest Link	Characteristics	Rating
4. Broadway between 17 <sup>th</sup> Avenue South and 16 <sup>th</sup> Avenue South	Bicycle	N/A	Mixed traffic; 25 mph speed limit; 4 vehicular travel lanes	BLTS 4
	Pedestrian	N/A	8' sidewalk; 25 mph speed limit	PLTS 1

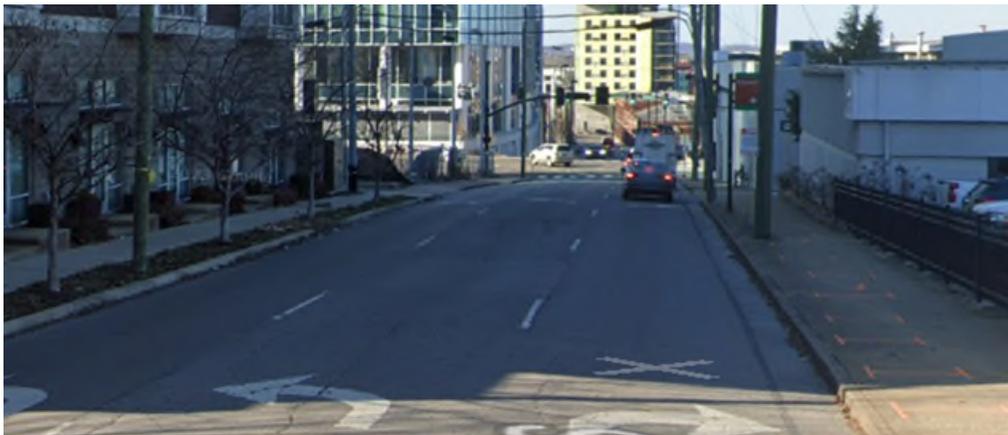
*Broadway between 17th Avenue South and 16th Avenue South*



*Segment 5 LTS Analysis*

Segment	Analysis	Weakest Link	Characteristics	Rating
5. 16 <sup>th</sup> Avenue South between Broadway and McGavock Street	Bicycle	N/A	Mixed traffic; 25 mph speed limit; 3 vehicular travel lanes	BLTS 4
	Pedestrian	N/A	8' sidewalk; 25 mph speed limit	PLTS 1

*16th Avenue South between Broadway and McGavock Street*



# Intersection Level of Traffic Stress

## Intersection 1 LTS Analysis

Intersection	Analysis	Weakest Link	Characteristics	Rating
1. Division Street and 17 <sup>th</sup> Avenue South / Music Square West	Bicycle	N/A	Approach segment rated BLTS 4	BLTS 4
	Pedestrian	N/A	Signalized intersection; no permissive turns; adequate pedestrian crossing infrastructure; enhanced crosswalks	PLTS 1

Division Street approach is rated PLTS 1.

## Intersection of Division Street and 17th Avenue South/Music Square West



## Intersection 2 LTS Analysis

Intersection	Analysis	Weakest Link	Characteristics	Rating
2. 17 <sup>th</sup> Avenue South and McGavock Street	Bicycle	N/A	Approach segment rated BLTS 4	BLTS 4
	Pedestrian	SB approach crossing	Unsignalized intersection; 25 mph posted speed limit; stop controlled crossing; 2 vehicular lane crossing width	PLTS 4*



*Intersection of 17th Avenue South and McGavock Street*



*Intersection 3 LTS Analysis*

Intersection	Analysis	Weakest Link	Characteristics	Rating
3. 16 <sup>th</sup> Avenue South and McGavock Street	Bicycle	N/A	Approach segment rated BLTS 4	BLTS 4
	Pedestrian	NB approach crossing	Unsignalized intersection; 25 mph posted speed limit; crossing not stop controlled; unknown AADT; 3-lane crossing width	PLTS 4

*Intersection of 16th Avenue South and McGavock Street*



PLTS 4 rating was assigned due to unknown AADT of 16<sup>th</sup> Avenue South. Also notable is a lack of adequate crossing infrastructure across 16<sup>th</sup> Avenue South.

*Intersection 4 LTS Analysis*

Intersection	Analysis	Weakest Link	Characteristics	Rating
4. 17 <sup>th</sup> Avenue South and Broadway	Bicycle	N/A	Approach segment rated BLTS 4	BLTS 4
	Pedestrian	N/A	Signalized intersection; 4-lane crossing width; permissive left and right turns	PLTS 2

*Intersection of 17th Avenue South and Broadway*



*Intersection 5 LTS Analysis*

Intersection	Analysis	Weakest Link	Characteristics	Rating
5. Broadway / West End Avenue and 16 <sup>th</sup> Avenue South	Bicycle	N/A	Approach segment rated BLTS 4	BLTS 4
	Pedestrian	WB approach crossing	Signalized intersection; 7-lane crossing width	PLTS 3



*Intersection of Broadway/West End Avenue and 16th Avenue South*

